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ÚSTAV JAZYKŮ

E-LEARNING AS A MEANS OF TEACHING AT UNIVERSITIES
E-LEARNING JAKO PROSTŘEDEK VÝUKY NA VYSOKÝCH ŠKOLÁCH

BACHELOR'S THESIS
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ABSTRAKT

Tato práce se zaobírá tématem e-learningu na vysokých školách. Zabývá se jeho vývojem od dálkového studia pomocí pošty, zapojením složitějších strojů na výuku a připojením na síť internetu až do současnosti. Práce se také pokouší odhadnout jeho vývoj v nedaleké budoucnosti. Mimo to pohlíží na faktory ovlivňující efektivitu e-learningu a jeho potenciální negativní dopady. Praktická část se skládá z výsledků provedeného výzkumu a jejich následného rozboru.

KLÍČOVÁ SLOVA

Anketa, Efektivita, E-learning, Použití e-learningu vysokých školách, Průzkum, Výuka za pomocí počítače

ABSTRACT

This paper aims to delve into the topic of e-learning and its use at universities. It attempts to describe its history - getting from distance learning, to learning utilizing increasingly more complex computational machines and finally the incorporation of the internet into the learning process. It also makes several predictions on what direction could e-learning head in in the foreseeable future. Aside from these topics, it also tries to describe what factors affect its effectiveness and takes a look at its potentially negative side. Then it deals with results of an e-learning related survey and their analysis.

KEYWORDS

Computer aided learning, Effectiveness, E-learning, Questionnaire, Survey, Use of e-learning at universities

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PROHLÁŠENÍ

Prohlašují, že svoje balakářskou práci na téma E-learning as a means of teaching at universities jsem vypracoval samostatně pod vedením vedoucího bakalářské práce práce a s použitím odborné literatury a dalších informačních zdrojů, které jsou všechny citovány v práci a uvedeny v seznamu literatury na konci práce.

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V brně dne …….. ……..

(podpis autora)

Contents

1 Introduction

Computers and information technology is all around us and with the current trends, their amount is only going to increase. It is only logical to use this technology for education and that is where the term e-learning comes in.

There are multiple we can define e-learning. Watanabe (2005) mentions ways we can do so: “distance education using the Internet and/or other information technologies” and “e-learning is a self-learning process using IT communication among other means”. The latter of which describes purely online (interactive) courses with progression at own pace with minimal intervention from course managers - or “teachers”.

In this thesis, I am going to focus mostly on the former. Not necessarily purely distance learning, but current and possible future ways to incorporate e-learning into the curriculum of universities.

2 A brief history of e-learning

While the term itself was first used in a professional environment in 1999 on a CBT systems seminar, the practice of distance learning reaches much further. One of the earliest forms of distance learning was introduced by Isaac Pitman in 1840 in the UK who used correspondence to teach his students shorthand - he used the mail to deliver assignments to his students.

2.1 Beginnings of automated learning

One of the early machines intended for learning was developed at the Ohio State University by Sidney Pressey. Pressey (1926) himself stated: “the procedure in mastery of drill and informational material were in many instances simple and definite enough to permit handling of much routine teaching by mechanical means.” The machine was designed to handle simple multiple choice tests. It revealed one question at a time presenting the tested individual with a limited number of choices. He/she then pressed the corresponding key, similar to keys found on a typewriter, and the machine marked his/her choice on the piece of paper where the test was printed. Although the machine itself did not succeed, it set a precedent for other machine learning systems that came after it. leerbeleving.nl suggests that it was partly because of the economic crisis in the following years.

During the second world war, the United States army needed a way to quickly and efficiently train thousands of new recruits. To achieve this goal, they chose to film instructional videos. The need for these, according to leerbeleving.nl arose with the advent of more complex to operate weaponry.

B. F. Skinner was a professor at Harvard who was, among other things, responsible for the so called “skinner box” - an apparatus designed to study the process of learning on mice. He proposed that learning should be directed by positive reinforcement. In 1950s he

developed a teaching machine intended for use in a broad range of studies. By presenting the knowledge in small and "digestible" chunks of information, his students were reportedly exhibited higher interest in the subject. The machine presented the testee a question and, unlike the aforementioned Pressey's machine, a window where they wrote their answer. After each question, the question on the wheel was displayed and the answer sheet moved to provide space for the next answer. There was only space for short answers within the range of few words.

2.2 Early use of computers

In the 1960s the idea of computer based learning was starting to be more popular with the computer based program called PLATO - Personal Logic for Automated Teaching Options. It was based a time-sharing computer system - there were multiple access terminals connected to a central mainframe which handled the actual program. (Jones 2015)

In the 1970s the email correspondence was slowly starting to be replaced by email correspondence and in the 1980s with the release of personal MAC computers further simplified the access to education.

2.3 E-learning for the general public

In the 90s, the release of the Windows operating systems increased the PC user even further. With the increasing number of potential students having internet access, some schools started to offer online only courses. As Miller (2014) mentions in his article: "[...] in 1994, CALCampus offered real-time education in its completely online school." The company Blackboard released their educational system called "Blackboard learn". It provided a complete solution for, among other, the exchange of study materials, testing, communication and tracking students' progress. It was reportedly an easy to use system without a steep learning curve. While the design would not be up to date nowadays, it would have probably been perfectly acceptable about ten years ago.

At the start of the 2000s, businesses started to utilize e-learning to train and educate their employees. E-learning 101 also mentions the advent of online degrees and claims that "[technology has] enriched [our] lives through knowledge expansion" (page 11).

With the increasing ubiquity of faster internet access, many platforms and streaming services emerged. Video streaming sites such as Youtube, while not primarily designed as educational platforms, helped spread educational content of various form among their large user bases. There is also a number of sites dedicated purely to educational content - some are free, some require a monthly subscription fee.

And last but not least, we cannot forget about the rise of fast enough, affordable mobile internet which further increased the accessibility of (not only) such content.

3 E-tivities

When dealing with e-learning, we need to ask ourselves several important questions. What approaches to learning are known to be effective, how to utilise the technologies available to us and what environments are beneficial for education and how to create them.

With the increasing number of students attending universities, the need to reduce costs while not reducing and ideally improving the quality of their education, comes a need to make personalized learning more efficient and effective.

The "hype" surrounding e-learning has for the most part died out as the internet became more and more taken for granted. While the word itself has become a something mundane, many people do not have a clear idea about what it means and how to utilise it to improve our personal and professional lives.

Gartner's "hype cycle" describes this situation in following way. At the start, there's a technology trigger - in this case the spread of personal computers and access to the internet (see chapter 2). Then there is the "peak of inflated expectations" followed by "trough of disillusionment" when a large portion of projects fails to deliver. After a certain amount of time (if at all) the technology gets better understood and the concept reaches the "slope of enlightenment" and plateau of productivity. (gartner.com 2017; Wikipedia)

My opinion is that e-learning is somewhere around the middle of the slope. There many emerging and established use cases, but there is still a very long way before it reaches its full potential - whatever that may actually be.

In his book, Gilly Salmon (2002), talks about e-tivities. These online activities are supposed to be motivating and engaging - in comparison to a "simple" textbook uploaded to a server. They are built around text based interaction between students and teachers, and are relatively cheap and simple to run.

The concept of e-tivities basically describes an online forum divided into sections for each subject which is used not only as a place where course participants receive assignments and submit their solutions but more importantly, a place where they are publicly discussed.

There is no obvious way to make online learning enjoyable and productive for a large number of people at a reasonable cost. Creating something more than "just" an online repository for online materials is expensive in terms of both money and time - teachers need to learn to work with a potentially new interface.

Salmon (2002) talks about two groups of people: participants - the students/learners and e-moderators - these need to know enough about the subject and be able to present it in such a way as to "spark" participants' interest. They need to give the challenge and take care of the course's pace.

Hardware constraints are not a considerable issue anymore since most students are expected to have access to the internet and most computers (and "recently" phones) are able to handle simple, web-based applications with relative ease.

There are, however, several concerns regarding online learning. Most of these revolve about the reduced social contact. Be it with the teacher or with other participants. Both of them possibly reducing the motivation to study. The face to face communication is replaced by text based one and the need to work on problems in groups may force participants to motivate each other to actively take part on the problem.

At universities, this wouldn't be an issue since it would serve as an addition to already existing lectures and laboratory exercises. And having a place to discuss problems and given assignments improves the learning experience and provides help among people who can't necessarily meet in person all the time.

Salmon describes a 5 stage framework - a “scaffold for a well structured and paced programme” which gradually builds on participant’s previous experience (Salmon, 2002, p.10). As they go through the stages, the number of people they interact with increases. In Salmon’s model, participants progress through the stages at their own pace - while this is possible on a purely web based education service, it is not generally viable on universities when the whole “class” has to progress through the class’ curriculum at more or less predetermined pace.

The first stage is called “access and motivation”. In this stage, it is important to get participants’ interest. It is simple to demotivate someone with a badly designed, unintuitive interface, unresponsive and generally frustrating interface. In this stage, e-moderators build activities designed to provide some sort of introduction to the subject and to make participants grow accustomed to the software. They should clearly state the purpose and goals of the activity from the very beginning and make said goals achievable. There are two main types of motivation, extrinsic and intrinsic:

Extrinsic motivation means being inspired by outside influences instead of one’s own feelings. (businessdictionary.com, 2017) Notable example of these stimuli are for example extra points for the final mark. These motivate students to focus on the outcome and since the whole reason behind e-learning is the end goal of gaining knowledge, this part is crucial.

Intrinsic motivation represents the opposite: inside motivation.. It’s self-motivation - participants are satisfied to take part for the sake of the activity itself. That the “path one takes is as important as (or more important than) the goal you’re heading towards”. This kind of motivation is considerably rarer.

One could argue that students should already be self motivated and not need an external stimulus since it is in their best interest to successfully finish their studies to be able to potentially be employed at for higher paying position. On the other hand, this may lead to them aiming for just that - to finish the class/study program with interest in their actual contents.

Second stage is called “online socialization”. In it, a micro community is created that lasts for the duration of the course. At universities, participants are likely to, at least vaguely, know each other from classes. It might, however, help them get to know each other and create a sort of a web of trust.

In the third stage, people interact with the content itself, as well as each other. There’s the possibility to exchange acquired information, to help each other with difficult tasks and to explain topics to each other, during which the ones “teaching” strengthen their own knowledge on the subject. Information in this stage should still be relatively short to “spark the flame of interest” - several hundred pages of study materials, more often than not, tend to do the exact opposite. Salmon (2002) also mentions leaning at your own pace, which, again is not really viable on universities.

There is a frequent need for help since the participants’ knowledge is still at relatively low levels. Regular and well structured summaries are of great importance at this stage as well since they help cement the skills and information gained during the course. E-moderators need to find the balance of activity - if they’re too involved, they might soon burn out and if they’re not involved enough, the participants might lose interest.

At stage four, participants should be aware of potentials of tools they posses and start constructing their knowledge in new ways. It is important to promote skills such as critical thinking - judgment, evaluation, comparison, creativity - discovery, imagination, hypotheses and practical thinking - application, usage and practice of acquired knowledge.

Frequent discussion and developing one's knowledge is the core of this stage. E-moderators should do a semi-regular summary of the discussions. Participants have the sense of their own progress and if they challenge each other and build on each other's contributions, it is a great sign they are ready to progress to the last stage.

At the fifth and last stage, both moderators and participants should have a clear idea on how to use the given tools effectively. Participants should be critical of themselves and be self-reflective. The use of humor and creativity is welcome at this stage. Experienced participants can help newcomers to the system - at universities, the teachers may "hire" exceptional students from higher grades to volunteer to help with the organisation of the activities.

From the concepts Salmon describes, I find the subject forums to be the most notable. These provide, aside the space for the usual announcements by teachers, the means for students to discuss the class' curriculum with other students they may not be able to get in touch with otherwise. Students with lower understanding of the subject can get help from the ones who understand it better. This may sound trivial, but doing this, students, aside from making the teacher's work slightly easier, (although this doesn't mean they cannot or should not participate themselves), cement their own knowledge and also help other students who may have not had such train of thoughts themselves.

It is clear that these need active participation from both parties without which it loses any kind of positive effect it might have and becomes mostly a nuisance one has to check on every once in a while.

4 Negative effects of e-learning

Unfortunately, with every benefit comes a downside. While the e-learning has made the education more accessible for a large number of people, there are some detriments we need to consider.

4.1 Health concerns

First there are various health detriments that come with using a computer for extended periods of time.

First of which is eyestrain mostly connected to staring at a bright monitor in a dark room. Having your display too close to your face leads to bad eyesight similar to how reading a book from not far enough away does. Another issue is that looking at something for too long without changing your focus distance (such as looking out of the window in the distance) can lead to further damage to your eye muscles and worsen your eyesight even more.

Aside from damaging your eyes, the screens also have other negative effects. The blue light they emit can negatively affect our circadian cycle. As the Harvard Health Letter mentions: “Blue wavelengths—which are beneficial during daylight hours because they boost attention, reaction times, and mood—seem to be the most disruptive at night”. Blue light at night can be compared to caffeine - when consumed at night or late in the evening, it keeps us long awake and since most people need to wake up in the morning, this leads to being tired the next day. If it continues for several days, this leads not only to decrease in work productivity but more importantly, it can be cause for several diseases.

“Regular poor sleep puts you at risk of serious medical conditions, including obesity, heart disease and diabetes – and it shortens your life expectancy.” (nhs.uk, 2015). While the blue light is not an issue exclusive to computer (and mobile phone) displays, and any light can potentially disrupt your sleep schedule, because of the length of exposure to them and the short distance that separates us from the display, they cannot be ignored in this regard.

Sitting in a chair for long intervals can also be damaging. Improper posture while sitting can lead to numerous health complications such as back pains and bad blood circulation. Lack of activity together with eating at irregular intervals and too much often leads to obesity.

All of these issues can, however, be prevented. Blue light can be filtered out by software solutions or special glasses, back issues can be prevented by using an ergonomic chair and we can stay fit by exercising and eating properly.

4.2 Other concerns

Another problem is lack of social contact. When everything is available online, there is no need to consult your classmates, your professor. And it is this contact that helps students prepare for their future jobs and lives. While this is a valid argument, learning is not the only reason why people talk to each other, so I personally do not see it as too much of an issue.

Computers in all their forms are able to perform a large variety of tasks. While this is partly a blessing, it is also their curse. A book can only do one thing - “display text”. Computer, on the other hand can, aside from that, also display video and pictures and myriads of other possibly distracting activities. It requires a much larger amount of self discipline than a printed medium to not stray away from what you are supposed to do to wasting hours upon hours doing something that is much more engaging, but ultimately completely useless.

This can be remedied by having a separate piece of computer equipment that cannot even handle any form of entertainment and is basically only good for word processor and few other basic things one needs for their school task and something more capable for free time. Although this is not always an option and is not in an of itself a solution. Procrastination is, after all, a modern day plague - meant, of course, as a gross exaggeration.

5 Effectiveness of e-learning

The recent years have seen an increase in the number of studies being carried out (Noesgaard & Orngreen, 2015). These focus on questions such as definition of effectiveness, how to measure it and what aspects make a particular e-learning solution effective. These studies can be divided into two major categories: quantitative and qualitative research.

Quantitative research relies on objective, numerical data which is not open to interpretation. This data is created through surveys, polls and questionnaires or by using statistical data from prior surveys. It generalizes across multiple groups or people in order to explain a particular phenomenon. (Babbie, 2010).

Qualitative research, on the other hand, tries to "understand the underlying reasons, opinions and motivations" (DeFranzo, 2011). It delves more deeply into a given problem rather than trying to gain surface level of understanding. It also relies on less objectively defined criteria that are harder to experimentally examine or measure. "Qualitative researchers stress the socially constructed nature of reality, the intimate relationship between the researcher and what is studied [...]" (Denzin & Lincoln, 2000).

5.1 Defining effectiveness

Effectiveness itself can be defined by several criteria. In the academic environment it is generally the learning outcome - knowledge that participant gains through the (e-)learning activity. This knowledge gain is measured by a pretest given prior to the first class and a final test (in majority of cases, the final exam) and the grade from said subject (Noesgaard & Orngreen, 2015).

In contrast, in a work environment it is tested by the participants' ability to apply the learned skill in practice, referred to as "Knowledge transfer" (commlabindia.com). This is often done through self assessments using a numbered scale across a number of factors (Noesgaard & Orngreen, 2015 - henceforth referred to as N&O) .

N&O state that while engagement and motivation are play a crucial role in effectiveness, they are not common subject of research. They also mention that through learning retention, it is possible to observe behaviour changes - mostly concerning courses that are supposed to inform people about a security issue and the ways it can be prevented.

In short, the major criteria are: acquired skills - what they learn, learning retention - how long they keep this knowledge, completion - what part of the taught skills they acquire, cost effectiveness - resources spent on the course per "unit of outcome" and personal satisfaction - how much the participants themselves feel they've learned vs what they knew/were able to do prior to the course.

5.2 Measuring methods

Large portion of studies compares the effects e-learning solution to a traditional face-to face learning. To be considered effective, it needs to perform such face-to-face learning in terms of, for example, the required time and human resources. And the majority tests utilizing the aforementioned method of pre- and post-testing.

Qualitative methods - that explore a small number of concepts in-depth - are much less common because they require more time and resources to carry out. These studies also work with more loosely defined criteria than quantitative studies so their outcome is not as clear.

Some of the data gathering methods consisted of recording a lecture from the perspective of the lecturer. He was given a set of tools for the class and after the lecture was over, he was asked to fill out a feedback form on his satisfaction with the tools they used during the lecture. The video feed also contained the screen shown to students. There were

also several observers who took notes. (Kumar, Yammiyavar and Nielsen, 2007). This approach was chosen to capture the complexity, challenges and propose further improvements - both expected and unexpected.

5.3 Factors affecting effectiveness

There are number of outside factors that affect the effectiveness of a chosen e-learning solution. These include previous experience - both in the subject and using the platform e-learning is on (not only the operating system itself, but also experience with similar user interfaces) . Then there is the age of the participants - this is mostly irrelevant on universities since the large majority of students tends to be within a narrow age range.

Attitude and motivation are also important factors.

6 Future of e-learning

Computers (and related technology) are still continuously evolving. While we are slowly but surely reaching the physical limits of this world in terms of circuit size - circuit paths narrower than a single atom, as far as we know, impossible - there are still potentially infinite advancements to be made. There are new peripherals to be invented, new algorithms to be developed and more new use-cases to be found. And according to some physicist, the exponential development in technology that Moore's law describes will remain for a long time (Timmer, 2014).

Mobile phones will play an obvious path in this. Even though their controls can be, for the lack of any hardware buttons, oftentimes frustrating, their generally intuitive and easy to use interfaces are what made them popular. With their ubiquity, they are the "go-to" choice when it comes accessing knowledge on the go. While, in my opinion, more suitable for "at your own pace" interactive courses such as Duolingo, they will likely see use in the university education as well. Aside from study materials, they can be used for testing. To ensure the students are not cheating, they can use the device's increasingly more precise sensors - most notably the camera. The aforementioned Duolingo uses this in their Standardized Language Test - with fairly strict requirements for the completion and the captured footage being reviewed by dedicated staff. (Schmidt, 2017). We might see such test on universities in the future, although it will probably not replace actual in-person examinations for at least several more years.

The recent years have seen the rise of VR headsets such as Oculus Rift and HTC Vive. While the concept of Virtual and Augmented reality is nothing new, they brought these into the environment of consumer electronics. A notable use case of these technologies are surgeon training simulators. These provide a reproducible training environment without the risks that "training" in real environment would entail. They are also very effective, with research done by IEEE (2014) stating: "By comparing the learning effect on [novices] and [near-experts], we have preliminary results that show the VR surgical simulator not only reduces errors in the actions but decreases the overall number of surgical actions required for completing the operation". Alongside the headsets, they also use motion tracking peripherals

with haptic feedback for further authenticity and make the whole training experience more than just "flailing their arms in the air in front of them".

The near future may see these technologies used in a large variety of fields. In the engineering field, they might be used for better visualisation of the operation of more complex machines that do not usually offer a chance to look inside their inner working while they are in operation. For architects, an AR solution may be used to overlay information over an existing building to better visualize the taught subject. The possibilities are virtually endless.

Rosen (2014) elaborates on the subject of possible gamification of education. This would make students more engaged and could provide further motivation beyond the simple "there will be a test and I have to study for it". I personally do not think we will see this on universities - at least not the classical "offline" ones - but it is certainly a possibility that this is the direction the education will head in.

6.1 End of the teacher profession?

There is a concern that computers will replace human teachers. I personally do not see this happening in the foreseeable future. As Peter Drucker (1997) said: "*Universities won't survive. The future is outside the traditional campus, outside the traditional classroom. Distance learning is coming on fast*". Although considering the twenty years that have passed since that quote, it will likely take at least another decade or two before we see a major change in this direction. And even if this change occurs, there will still be a need for teachers. Admittedly, their role will change - most of their work consisting of course preparation leaving more time for them to prepare "richer content" for said courses.

Many a science fiction novel depicts robots taking over humans' jobs - even the job of a teacher. This, however, is even more far fetched, although we may see learning based on artificial intelligence. That is, of course, until (and if) a computer-to-brain interface is developed when there will be no need for teachers anymore.

7 Conclusion

E-learning is undoubtedly the future. The technology currently available is sufficient and judging by the past and current trends, it will only get more capable. The only obstacles in the way are the time and resources needed for new e-learning tools and/or adapting existing ones to universities' needs and the arguable unwillingness of people to switch from the established paradigm of "don't fix what's not broken". While I understand and partially agree with this sentiment, it is not the way forward.

As I alluded before, current form of e-learning consists of moving what was previously only done purely in person - "offline" - on the internet and the electronic medium as a whole. While this has made the matters connected with universities significantly more convenient and made studying possible virtually anywhere, it does not use the "full potential" of the medium.

E-learning needs to provide more interaction than "just a portable library". Tools for learning vocabulary and syntax for language related courses, interactive programs for engineering related subjects, etc. And as I mentioned in the third chapter, subject forums which would provide more of the much needed interaction. But again, all this would require a

large amount of time and effort from the lecturers/professors/teachers which they often simply do not have at their disposal.

8 E-learning survey

For the practical part of my bachelor's thesis, I have chosen to conduct a relatively small scale survey among both students and teachers of the Faculty of Electrical Engineering and Communication of Brno University of Technology. Each of these groups received a slightly different version of the questionnaire.

I have addressed 36 teachers with a fairly standard form email. I attempted to formulate the message as politely as reasonably possible. It contained all the, in my opinion, important information such as who I am, why I am sending the aforementioned email and a thank you for their efforts. This version of the survey contained questions about which functions of Moodle they use and how satisfied they are with the e-learning system Moodle. I have received 15 responses which is slightly over 40% of the 36 surveys sent out. I consider this to be a fairly high response rate.

As far as the student surveys, I have posted this survey in the 2015 FEKT facebook group. These respondents have studied on this faculty for the past three years and thus have had enough time to formulate their opinion on the system as a whole and how it is utilized. The message included with the survey was considerably briefer than the one included with its counterpart. The survey itself was focused on similar topics as the teacher version, but from the point of view of the students who do not have access to course creation tools. I have received almost 60 responses to this version of the survey. This is in my opinion large enough sample size to have a fairly precise idea of what the general consensus is.

In the general satisfaction part of the survey, I used answers of "I mostly (dis)agree" and "I strongly (dis)agree". I did not include neutral responses because these, in my opinion, hold no value and their omission at least somewhat forces the respondents to think about their answers. The rest of the questions offered a fairly exhaustive range of answers including a "none of the above"-style answer.

At the end of the survey, I included a text field intended for free form answers, I will address responses in this part separately at the end of this chapter even though they partially overlap with few other questions.

8.1 General satisfaction

Both groups of respondents were asked these fairly general questions. They were asked whether they think the system contains everything they need whether it is logically structured - i.e. everything is easy to find without the help of an external search engine - and whether they like the system's design - i.e. how aesthetically pleasing and user friendly the UI is. Here are the results:

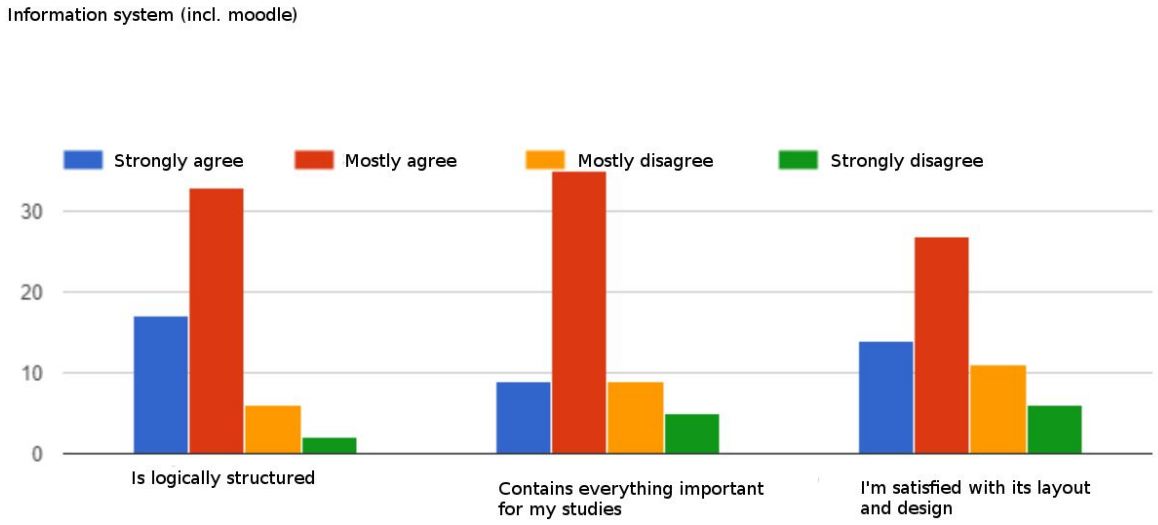

Fig. 1: Student satisfaction with the IS

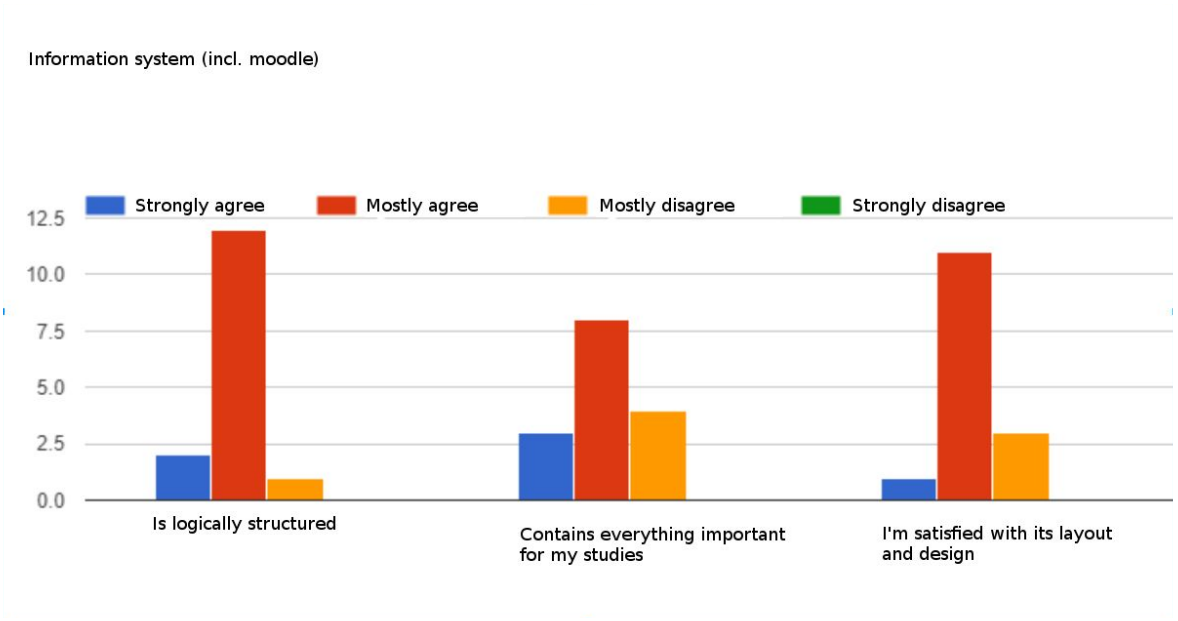

Fig. 2: Teacher satisfaction with the IS

Both groups feel that the e-learning system is, for the most part, logically structured. What is, in my opinion, surprising is that such a large portion of students feels like there is not room for improvement in this area. Teachers, on the other hand, are considerably more skeptical. This is likely because they use the system much more extensively than students who only see the system from the "user perspective".

The responses to the second question, while still mostly “positive”, are more skewed towards the negative indicating that they feel there are improvements that could be made and that the system would benefit from some additional functionality.

Regarding the UI design, teachers seem to more or less agree that it is “good enough”, while the students are partially inclined to the negative side with almost a third of them saying they do not like it, hinting at the fact that it could use some major improvements.

8.1.1 System from the point of view of a student

One of the major issues that has been brought up every once in a while was the fact teachers use a completely different system and therefore interface to interact with the information system.

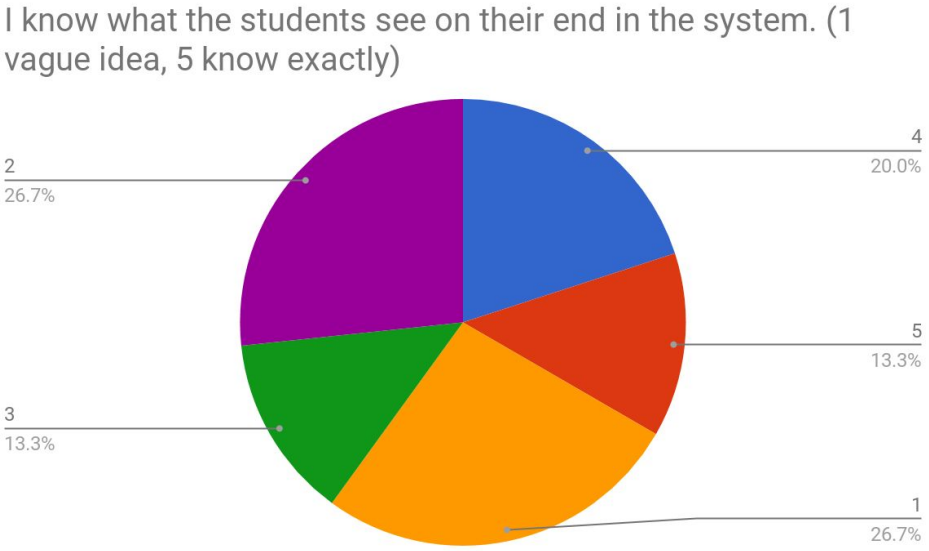

Fig. 3: Teachers’ awareness of student GUI

From this graph we can see that this is indeed the case since more than half of the respondents admits to have little to no idea what students actually see on their end. This should not be the case for Moodle since it allows to view the courses as a student but it is likely hidden well enough to not be used regularly.

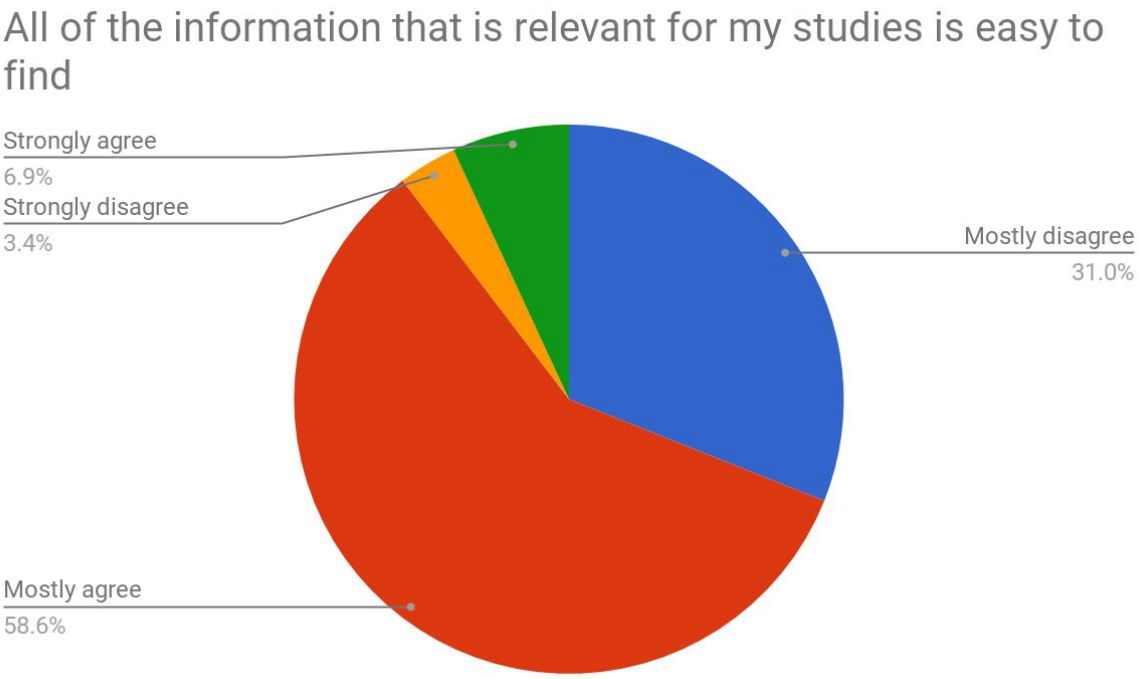

Fig. 4: Ease of finding information

While most students who think that most of it is relatively easy to find, there are almost equally as many who disagree with this notion. The main issue at hand is, in my opinion, that the content is too spread out over the website. This is not only a matter of Moodle being separate. There is also a bigger issue which is the fact that large portion of very important information is on a completely separate faculty website with no obvious way to get there without trying your luck with an external search engine. A website you have to manually check every few days to keep yourself up to date because there are no notifications when something new is added. Also there is the fact that the search function is borderline useless. On top of that, email - one of the most important communication channels - is, again, on a completely separate website. The whole system is, in my opinion, in a desperate need of a consolidation. This would, however, require a complete rework of the whole university information system. This would require not only a very, very large amount of time and resources but all users would need to get used to a new system, interface and everything included with that. It is very arguable whether such drastic measure is needed or a worthwhile allocation of available resources.

8.1.2 Comparison to other systems

Due to lack of experience with other learning systems among the survey's participants, the results from both groups had to be merged to obtain a bigger sample of twelve - four of which were teachers. This number being low is understandable for multiple reasons.

Due to the popularity of Moodle, it is not unlikely that it was the e-learning system used on their high schools - that is if they had access to one at all. This leaves other universities as basically the only other place they could have come across another system. And since the survey's sample were students of the third year of the bachelor program, to most of these, this is likely the first university they have attended. The exception to this may be students studying 2 universities at once or, for one reason or another, trying their luck at another bachelor program.

For teachers, it may be semi-uncommon for them to teach (and have taught) at multiple universities. There is also anecdotal evidence that says that people who graduate at a university tend to fairly often also stay there to teach - in case they decide to pursue a teaching career. I do not, however, have any data to support this claim and it is simply just a rumor.

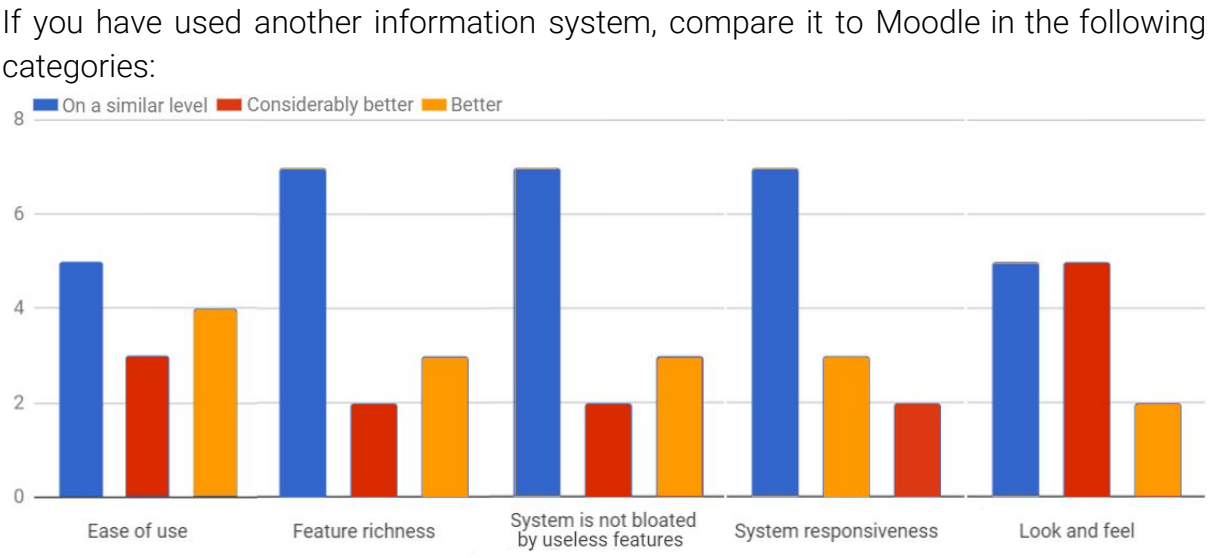

Fig. 5: Comparison of VUT IS to other e-learning systems

It is important to note there were options to rate the other system(s) as "worse" and "considerably worse" - options which none of the respondents chose. Also, for the sake of simplicity, the questions are going to be henceforth referred to by numbers.

The majority of the people who have used another system consider it to be equally as good. This is most notably the case with the questions 2. 3 and 4. Although over 40% of the respondents still prefer the other system.

Questions 1 and 5, on the other hand, indicate the opposite. The majority of the respondents considers the other system to be better designed and thinks it looks better in general. Most of the respondents also find that system simpler from the user perspective.

8.2 Use of Moodle

This part is going to deal with the rate of how many teachers use the Moodle part of e-learning, which parts of it they use. It also deals with computer/online tests. This part of the survey did not touch on the subject of the non-Moodle part of IS since every subject uses it to a lesser or greater extent.

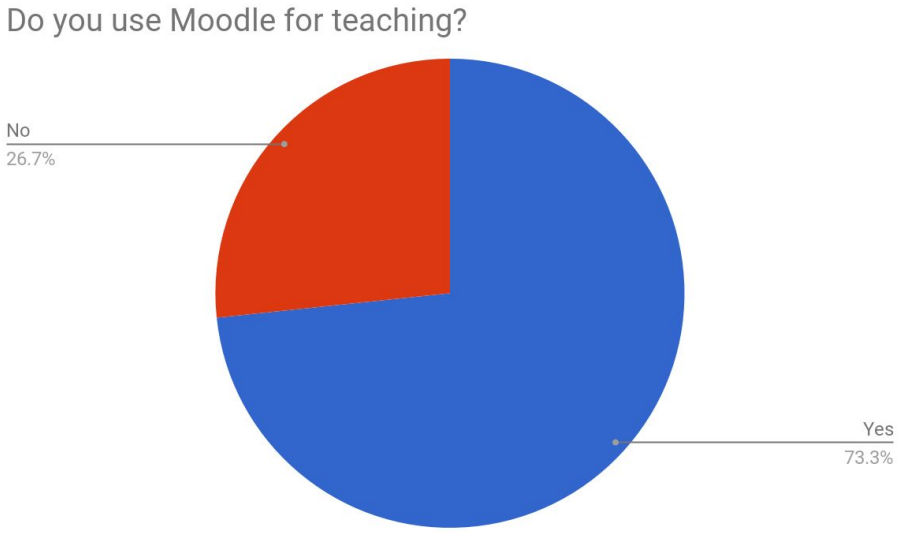

Fig. 6: Percentage of teachers using Moodle

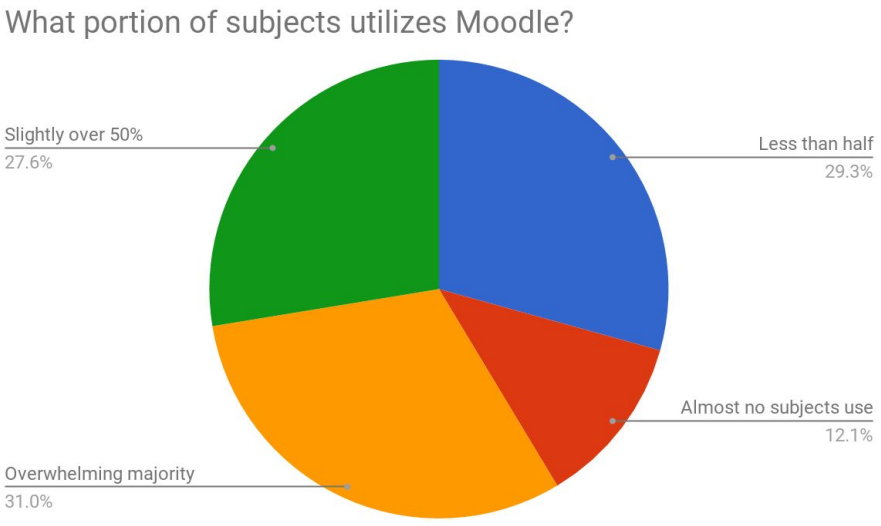

Fig. 7: Portion of subjects using Moodle

According to the teacher survey, almost three in four teachers use Moodle for at least on of their classes. The chart in figure 5 confirms this while shedding more light on the subject. Over half of the respondents reported that the majority of their subjects utilize

Moodle in one way or another. Only about 12% of the participants claim that only a small minority of their teachers actually use Moodle.

There are several possible reasons that not all teachers/classes make use of Moodle as a part of their curriculum. One of them may be the fact that the subject simply has no use for it. There are plethora of classes that do not have any laboratory exercises, handle all assignments in person and never use any computer based tests. One can argue whether this is simply the teachers not fully utilizing the tools in their possession to their fullest extent or whether the subjects truly have no use for them.

The other possible reasoning for this phenomenon is that teachers find these tools lacking some crucial features, do not find the UI user friendly or simply prefer a different method of handling the tasks associated with their respective subjects.

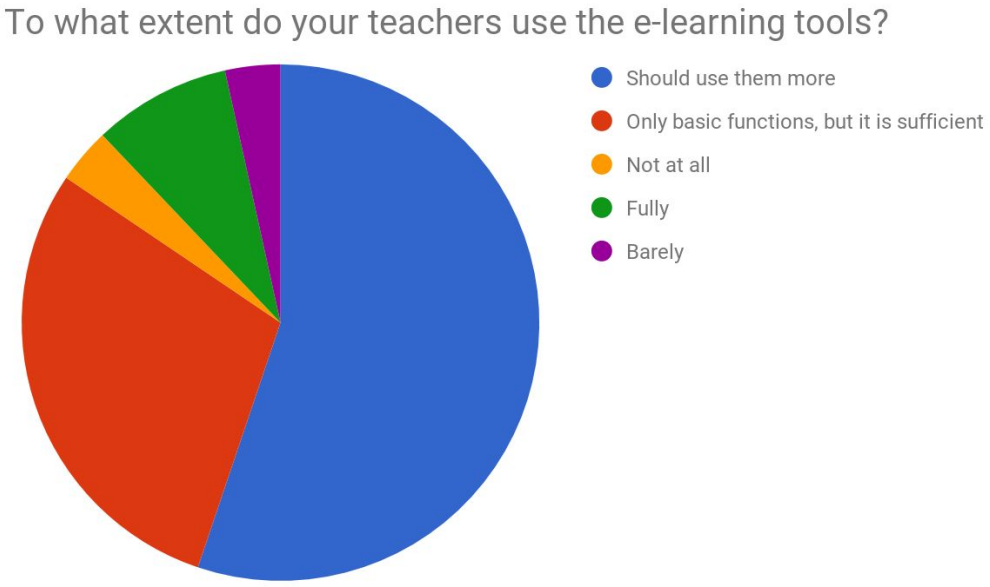

Fig. 8: Student view of e-learning utilization

Students, for the most part, feel like their teachers only use the bare minimum from the tools they are given. While they are fairly divided in the topic of whether or not the other tools should be incorporated in the curriculum, the majority still thinks that this is the case.

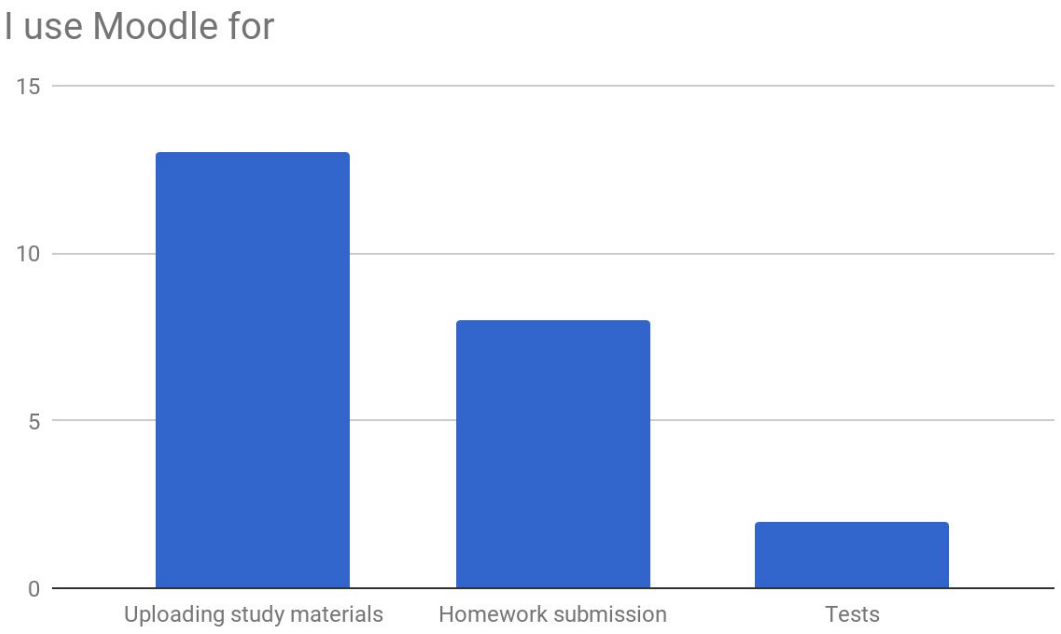

Fig. 9: Functions of Moodle

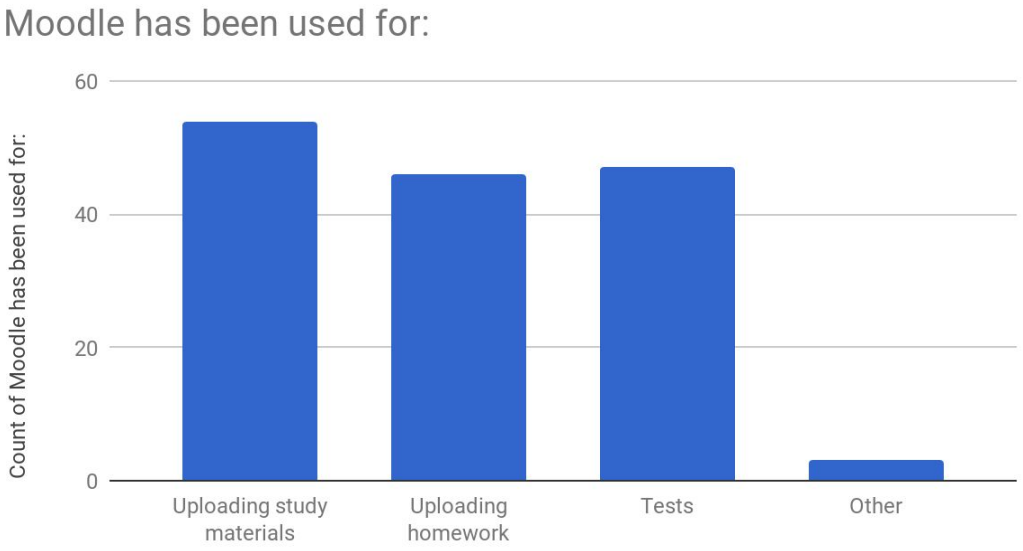

Fig. 10: Functions of Moodle

Figures 8 and 9 only further confirm the limited range of applications Moodle is used for. The most frequent use-case for it is, unsurprisingly, repository of study materials. The benefit of using Moodle for this is that it is better structured and more easily navigable than the studis part of IS. I am not trying to understate the importance of having an easily accessible source of knowledge relevant to the subject, but it is clearly not fully utilizing the tools.

Homework submission is relatively close behind at second place. However, generally home projects are nowhere near as frequent as the submission of new study materials so this makes the chart slightly skewed. But this shows the trend of teachers using the electronic medium in place of handing in projects printed out on paper. An exception to this are any sort of subjects that have laboratory exercises. Laboratory reports are almost exclusively handed out in the aforementioned printed form and I do not see a change happening to this anytime soon - mostly due to the way they are written.

Then there are (online) computer tests. From the student part, we can see that the overwhelming majority of students have done at least one online test over the three years on the faculty. However, the teacher's part indicates that they are not used very frequently. The next subchapter is going to deal with these more in-depth.

8.3 Electronic and online tests

Out of the 15 teachers who filled out the questionnaire, only 2 have ever used the built in Moodle tests - both included multiple choice questions and short-form answers. Since this is inconclusive we are going to focus on the results from the student part of the survey.

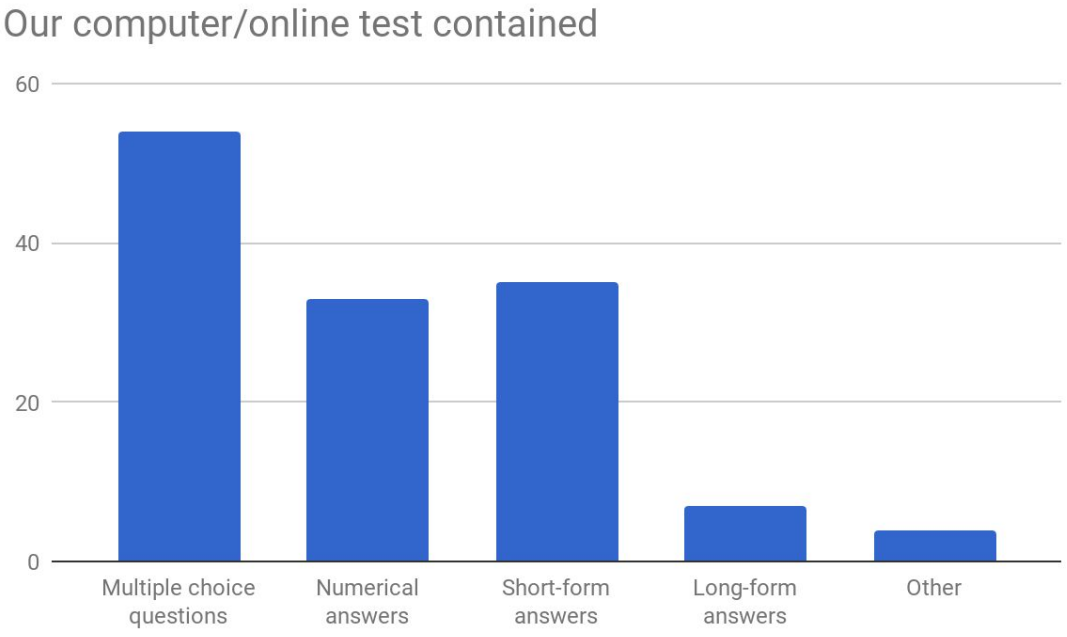

Fig. 11: Computer tests

At the first place in terms of usage we can see multiple choice questions. This is fairly unsurprising since this is the (arguably) least complex type of tests - they are easy to set up, their evaluation is purely objective and they generally convey very clearly what kind of answer the teacher wants to see. The other benefit of these is that they are 100% automatic - meaning that, among other benefits, the students can see their results basically immediately.

One can argue that they do not force people to think as much as an open-ended question would. This certainly depends on the question itself, what is the subject matter and many other factors. The fact that a multiple choice question does not mean that the answer is obvious and can just be guessed. When we factor in the fact that there is generally a penalty for wrong answers, they can be a fairly decent substitute for traditional open questions.

On the second place, we have short, free-form answers. These are the logical extension of the aforementioned multiple choice questions in areas where those are not sufficient for the test/question at hand. It is understandable that they are almost as popular. They also arguably force a person to think more. Their downsides include the fact that even though they can be partially corrected automatically, they require some manual oversight in case the student answers in a format that the teacher did not expect and code in.

Numerical answers are essentially limited free-form answers. They are much easier to automatically evaluate since the characters are limited to just numerals.

Long free-form answers are used considerably less frequently. This may be due to the fact that they require manual review of the students' answers and as such, they do not provide any substantial benefits over regular paper tests. The only arguable advantages of these is the fact that they do not require paper and are guaranteed to be readable. On the other hand, they require a computer to fill in and the teacher would very likely just print out the tests and evaluate them that way - thus practically defeating the purpose of electronic tests.

8.3.1 Perceived value of electronic tests

In this part, we are going to take a closer look at what our respondents think of electronic tests in general, whether they prefer them over traditional paper versions and the possible problem of cheating during such tests.

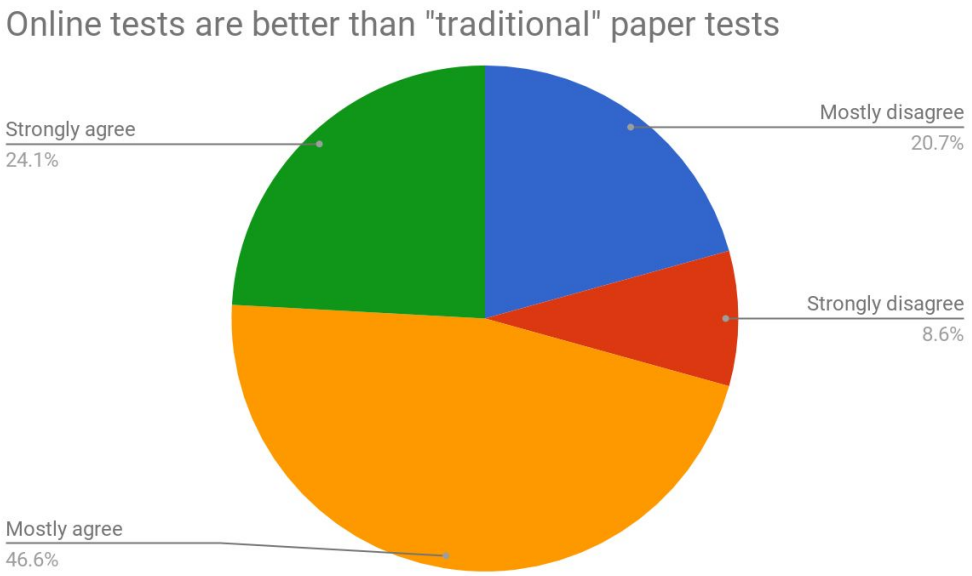

Fig. 12: Students' opinion on electronic tests

The majority of the students prefer tests done on a computer over the tests written on a piece of paper. Part of the reason may be that young(er) people are more attracted to the new technology and would therefore like to also use them for study purposes. Another reason could be that writing on a computer puts arguably less stress on your hands and is easier in general. In addition to that, computer tests tend to have shorter answers - most often multiple choice questions or short text ones (see fig. 10). Therefore it is possible that students have connected computer tests with easier questions and therefore want to write more tests this way since they may think that it would mean easier tests for them. This is probably not a conscious decision, but I think it plays a significant role in this case.

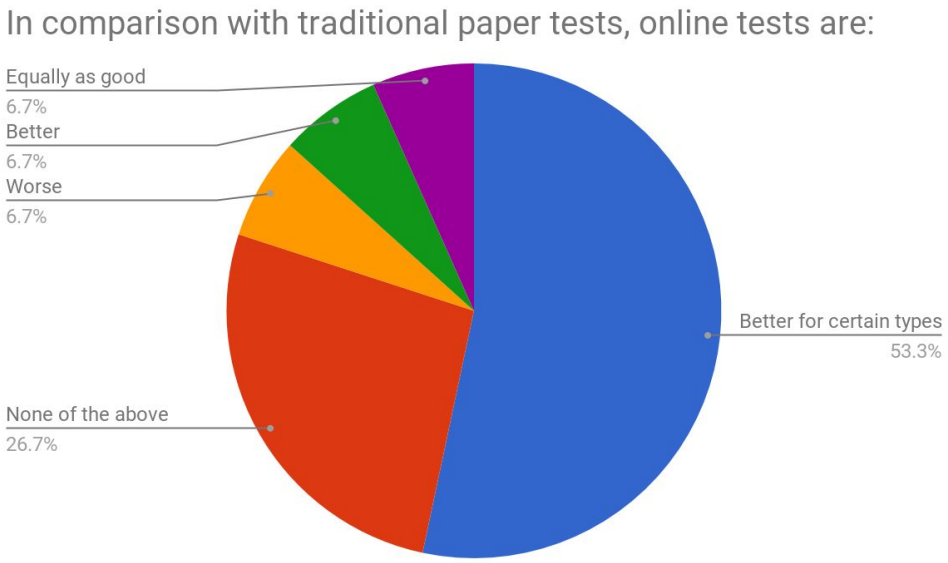

Fig. 13: Teachers' opinion on electronic tests

Teachers, on the other hand, are considerably more skeptical about online and electronic tests. Slightly over half of the survey's correspondents think that they have their place in the curriculum. This, however, does not mean that they are fit for every test. They can be useful for quick mid-semester tests or for quick, at home exercise tests. But for the most part, they are unfit for final exams since these generally require a lot of writing on the student's part. And since they require a computer, the teacher needs to plan ahead to find and book a classroom equipped with enough computers. They also require oversight since the students have access to internet and therefore basically anything on it. I will address this later on, in the next chapter.

8.3.2 Cheating in online tests

Cheating is one of the many hurdles that stand in the way of online tests. This subchapter will deal with teachers' opinions on the severity of this issue.

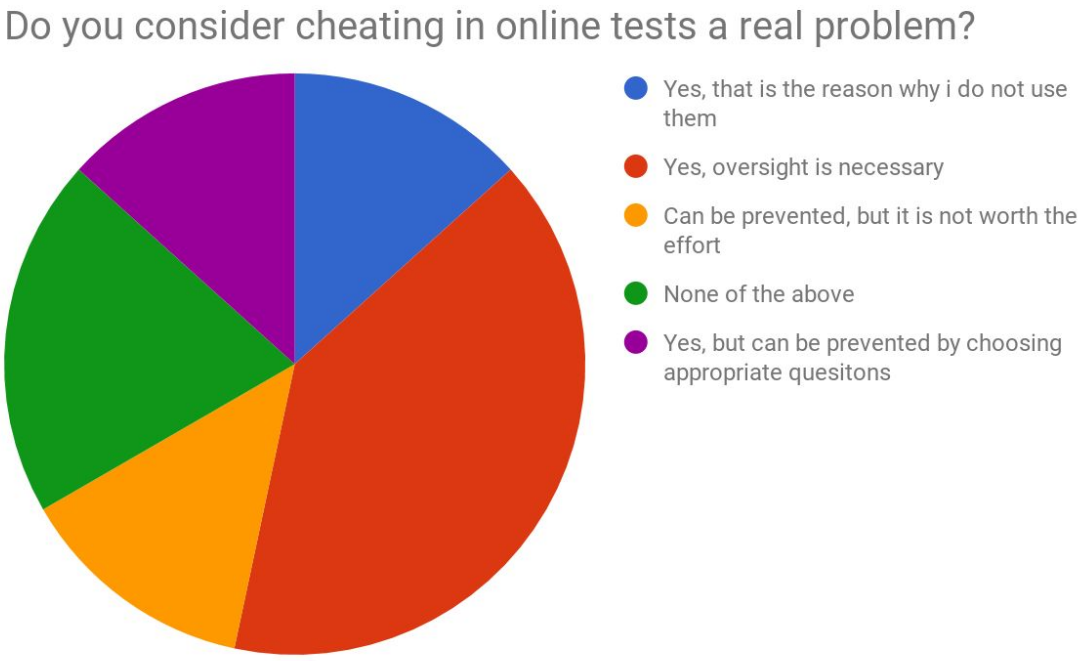

Fig. 14: Cheating in online tests

About 40% of the addressed teachers are convinced that tests need to be done under supervision. This naturally rules out any tests done at home or dormitory since there is no way to guarantee such oversight outside the school grounds.

For over a fifth of the respondents, this is the reason they do not use them at all. Either they do not believe it can be solved or that the solution would require an unreasonable amount of effort. It is natural to want to stick to the procedure that has worked so far over a new, overly complicated way of doing a task that subjectively brings nothing new to the table and only causes unnecessary complications.

A small portion thinks that it can be prevented and considers it worthwhile. The list of possible solutions includes making several versions of the tests, setting various time limits or making questions students have to really think about. Probably the best solution would be to utilize all of the above - I.e. personalized tests with a time limit and problems that require some deeper knowledge of the subject to solve. The timer would make attempts to cheat by looking up solutions online and personalized questions would make it harder to copy from your classmates. Of course this solution is not perfect and would not prevent a “friend” doing the test for the tested student for example.

8.4 Subject forums

Since I dedicated a whole chapter to Salmon’s concept of online forums as a means of communication between students and teachers, I decided to ask whether or not they would

like to have such forum for each subject. Admittedly, there are forums included with Moodle, but they have to be manually enabled and are so hidden away that even if the teacher does decide to use them, nobody will use them - be it for the lack of knowledge that they exist or out of “fear” of being the first to post there. These forums should be an integral part of every subject/class and they should be on the front page, not buried away somewhere in Moodle.

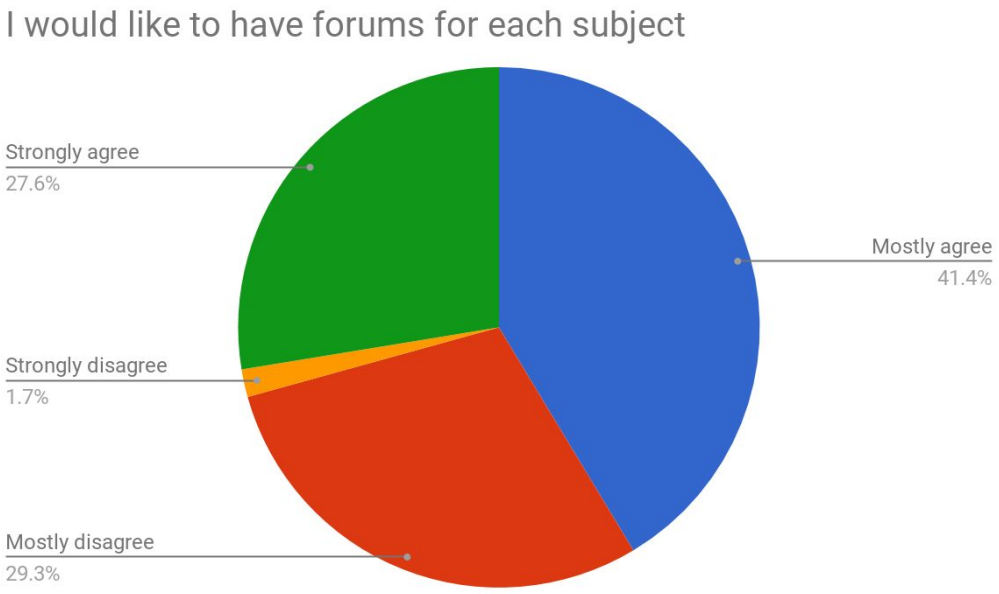

Fig. 15: Students’ interest in subject forums

As figure 14 tells us, a large majority of almost three quarters of the addressed students would like a subject forum. These forums a place to for teachers to direct all the questions to. These questions can only be answered once and the teacher will not be flooded by several emails asking the same exact question over and over. It also provides a place for students more easily to discuss and solve issues they may have come across while, for example, working on an assignment or any other form of homework.

8.5 Specific comments, complaints and suggestions

This part will deal with comments and suggestions from the respective section of the questionnaire.

One of the teachers describes their struggles with trying to copy the course data to the next semester. Since the classes do not change dramatically from semester to semester, this would be the logical course of action. However, the system was unable to copy said data properly and corrupted it in some way. Fixing this issue would have require too much time and thus this led to the teacher completely abandoning Moodle and relying on an external hosting service over which they have control to a greater extent. Moodle was useful for

handing in assignments, however, there are other and, arguably, better ways to do this using the Apollo system - i.e. completely outside Moodle.

A student mentions that while there are forums, they are not used. He/she says that teachers should use them much more and redirect all questions to the forums.

This mirrors my suggestion from the previous subchapter that forums should be placed visibly and integrated into the routine of each class. The teachers would have to check the forums regularly and, in rare cases, slightly moderate the forums in case someone gets slightly too passionate about a certain issue but in return, it would save them a non-negligible amount of work they would otherwise have to do due to, for example, multiple duplicate questions on the same topic.

In most cases, teachers would not even be the ones answering questions, but the students themselves. This may increase their interest the course and thus the amount of information they take away from it. Understandably there are also possible downsides to this. The teachers would have to at least partially read every post to prevent students from (unintentionally) misinforming each other for instance.

Then there are multiple complaints about study materials being hard to find. Either they are on the course page, in Moodle, in the "news" section or even better on a completely external site with no link anywhere to be found. In such cases, one has to resort to "googling" the website because there is no other easy way to get to the materials they require. There is also a suggestion from a student that would like a notification every time there is a new study material available. In the current system, students have to regularly check each of these places for each course to keep up to date with the latest development in not only all of their subjects, but also for example relevant faculty news.

On subject of the system being too scattered, students would also like the email to be integrated with the rest of the system. One of the students has reportedly been unable to log in to the email since the first year. It is honestly a mystery how this person has been able to study until now without the email and the problem of lost login details should be relatively easily solvable by going to the system administrators but even as an extreme case, it illustrates the issue at hand.

And last but not least is a complaint from a student who comments on the limited ability to access past courses in Moodle. This can be a real issue when a student is trying to find the study materials for their chosen classes for the final state exam.

8.6 Survey conclusion

E-learning system of the Brno University of Technology as a whole is, for the most part, "good enough". If this was not the case, it would have been replaced by something that is, something that satisfies the large majority of the required criteria. There is, however, always room for improvement and thus I will attempt to summarize my findings from the survey.

First of all, there should be a simple way for teachers to be able to see what students see - to be able to "login" as a student account and see the system from their perspective. This would eliminate a lot of guesswork they need to deal with on a semi-regular basis. This is an issue that has been brought up time and time again by teachers who use a completely different system with a completely different interface and have to ask whether the change they made in the system is actually visible to them.

Secondly, the whole system is too scattered and could use some form of consolidation. This is not only limited to study materials that can be in multiple places within the system. It also concerns faculty news. At the very least, there should be a link in the system to this website. Ideally there should be some form of a notification whenever anything new and important is added to that website. For example, during the course registration period, there should be a link to the relevant document that tells the students at what time this registration is taking place for their respective field of study.

Thirdly I have to reiterate the positive impact having a separate forum for each course would make. It would help both students and teachers alike. Students would be able to find information about their studies faster. All this without having to rely on desperate attempts to "google" everything or third party social media of the likes of facebook. And teachers would have a single place where they can redirect all questions about their respective course. They would need to be relatively active on this forum, but I believe it would be worth the time and effort invested.

I do not believe that "forcing" teachers to utilize e-learning more in their subjects is a reasonable course of action. There are courses that do not need them and forcibly including e-learning in their curriculum would be very ill advised. Some teachers view e-learning as little more than an unnecessary complication. It is understandable, an upgrade is hardly an upgrade if it comes with just as many downsides and hurdles as supposed fixes for issues of the old system.

For these changes to take place, the whole system would basically need to be rebuilt from ground up all over again. This would bring a whole another set of issues. Developing software on such large scale would an immense amount of resources. It also does not happen "overnight", it would take a non-trivial amount of time to not only write the program itself but also to test it, take people's feedback into consideration and many other complications. On top of that, making such large-scale changes to people's software tools is always met with some opposition. People dislike having to learn to use new programs without knowing the benefits this new software would bring. They also have to agree that these changes are indeed as beneficial as they are claimed to be.

All things considered and despite my earlier claims, I do not believe a large scale rework of the system is a sound idea. Mostly for the reasons I mentioned earlier. It would, however, greatly benefit from the aforementioned three points - most importantly the forums.

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10 List of images